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(54) Apparatus for rolling flat sheets of food material

(57) An apparatus for rolling up a laminar sheet of food material (B) such as cheese or ham into a tubular shape (B'), comprising an assembly of multiple rolling-up rollers (d, e, f, g) located at a terminal zone (1) of a conveyor (a) for the laminar sheet of food material. The rolling-up rollers are substantially equal in diameter and rotated at substantially the same speed and arranged with their axes on a circle so that the multiple rolling-up rollers may contact an outer surface of the laminar sheet of food material and thereby roll it into a tubular shape within the space between the rolling-up rollers. The apparatus allows a laminar sheet of food material to be efficiently rolled up into a tubular shape.

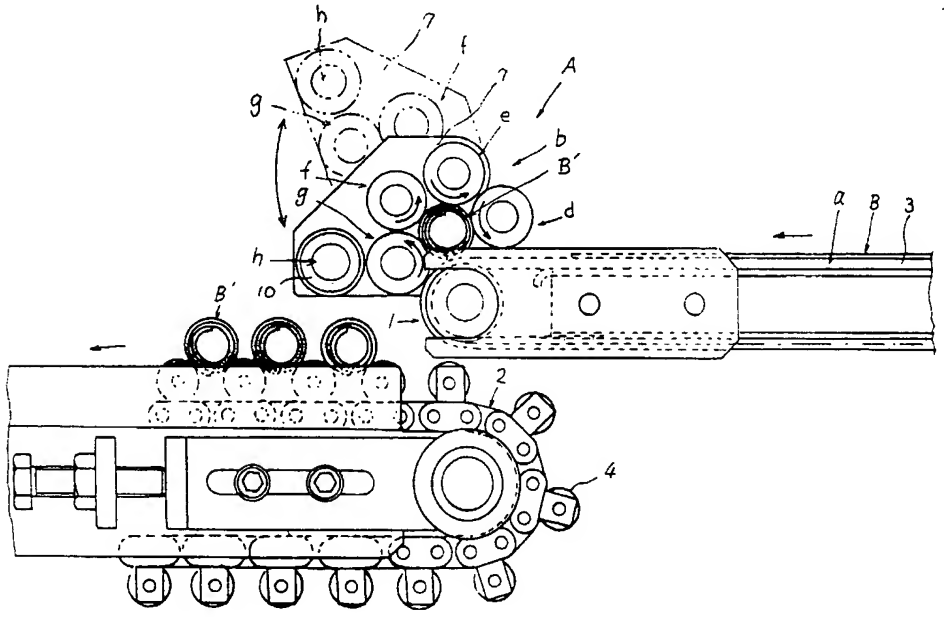

FIG. 3

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Description

[0001] This invention relates to apparatus for successively rolling up flat or laminar sheets of food material such as cheese or ham into a tubular shape.

[0002] No mechanical apparatus has previously been developed, which is effective in practical use to roll up laminar sheets of food material into a tubular sheet and therefore such processing has necessarily been carried out by hand. Processing by hand has sometimes led to inconsistency of the individual rolled products and even to unsanitary unfinished products.

[0003] In view of such problems, it is a principal object of this invention to provide a novel apparatus developed on the basis of various experimental studies which will go at least some of the way towards overcoming the above disadvantages by rolling laminar sheets of food material with a high efficiency mechanically, rather than by hand labour.

[0004] The object set forth above is achieved, according to this invention, by an apparatus for rolling up a laminar sheet of food material into a tubular shape comprising:

an assembly of multiple rolling-up rollers located at a terminal zone of a conveyor carrying said laminar sheet of food material,
said rolling-up rollers having substantially equal diameters and rotating at substantially the same speed and arranged with their axes on a circle so that said multiple rolling-up rollers may contact an outer surface of said laminar sheet of food material and thereby roll up the laminar sheet of food material into a tubular shape.

[0005] The outermost rolling-up roller of said assembly serves also as a driving roller and the remaining rolling-up rollers are mounted so as to allow swinging upward while still rotating. Such swinging upward occurs around the rolling-up roller adjacent to said rolling-up roller serving as the driving roller so that the remaining rolling-up rollers may be rotated outwardly.

[0006] A mechanism to open said remaining rolling-up rollers outward comprises an actuating cylinder which causes a pair of bearing plates rotatably supporting all the rolling-up rollers to swing upward, i.e., to be opened as said actuating cylinder is actuated. This swinging upward of said bearing plates and therefore of said remaining rolling-up rollers occurs around said rolling-up roller adjacent to said rolling-up roller serving as the driving roller.

[0007] A driving mechanism to rotate the assembly of rolling-up rollers and said actuating cylinder are both placed on the same side of the apparatus with respect to a conveying direction of the conveyer. The respective rolling-up rollers have their circumferential surfaces appropriately roughed to prevent said laminar sheet of food material from slipping on or sticking thereto.

[0008] An embodiment of the invention will now be described with reference to the accompanying drawings; in which:

Fig. 1 is a perspective view showing the entire apparatus according to the invention;
Fig. 2 is an enlarged perspective view showing a part of the apparatus of Fig. 1;
Fig. 3 is a side view of part of the apparatus of Fig. 1 showing important parts of a feeding conveyor, a rolling-up roller assembly and a discharging conveyor, respectively; and
Fig. 4 is a diagram illustrating a manner in which said rolling-up roller assembly operates.

[0009] Reference numerals used in the drawings are identified as follows: A: apparatus to roll-up laminar sheets of food material in tubular pieces; B: laminar sheets of food material such as cheese or ham; B': product rolled up into tubular pieces; a: feeding conveyor; b: a rolling-up roller assembly; c: discharging conveyor; d-g; individual rolling-up rollers; d1-g1: extension shafts; d2-g2: pulleys; h: rocking shaft; 1: terminal zone; 2: staring zone; 3: rope belt; 4: roller chain; 5: frame plate; 6: input roller; 7: bearing plate; 8: actuating cylinder; 9: elevating lever; 10: ball joint; 11: stretchable belt; 12: input belt.

[0010] This invention relates to a mechanical apparatus to roll up laminar sheets of food material such as cheese or ham into a tubular shape. The invention aims to improve the efficiency of rolling up laminar sheets of food material, which has previously been manually carried out, by using said mechanical apparatus.

[0011] Conventionally, a thread- or belt-like long food material has been rolled up into a tubular shape by winding it around a tubular core put on a rotary shaft or the like.

[0012] However, flat or laminar sheets of food material such as cheese or ham are too short to be adapted to be wound around and then removed from said rotary shaft or the like. Particularly in view of the particular form of the object to be rolled up in a tubular shape, the flat or laminar sheet of food material has necessarily been manually rolled up to form a tubular product.

[0013] In view of the fact that the object to be rolled up is a flat or laminar sheet of food material, the apparatus of this invention has a unique construction. Specifically, the apparatus is located at a terminal zone of a conveyor to roll up said laminar sheets of food material successively fed by said conveyor into a tubular shape. The apparatus comprises an assembly of multiple rolling-up rollers which are substantially equal in diameter and are revolved at substantially the same speed and arranged with their axes on a circle. Each of the laminar sheets of food material is rolled into a cylindrical form having a thickness of 2 to 3 layers with its outer surface being supported by the inner side of said rolling-up roller assembly. Thereupon, the roller assembly is partially

opened outwardly so that the laminar sheet of food material in the space between the multiple rollers which has been rolled into a tubular shape may drop onto a discharging conveyor and be conveyed away thereby. The laminar sheets of food material rolled up into a tubular shape then drop onto the discharging conveyor without being significantly deformed.

[0014] The rolling-up roller assembly preferably comprises four component rollers of which the outermost one (the roller which the flat or laminar sheet first passes) serves also as a driving roller. The respective rolling-up rollers have extension shafts which carry thereon pulleys about which a driving belt is wound. The driving belt is also wound around an extension shaft of the outermost roller and in this way, said outermost rolling-up roller drives the remaining rolling-up rollers to rotate respectively in a direction enabling the laminar sheet of food material to be rolled into the tubular shape.

[0015] Having rolled up the laminar sheet of food material in 2 - 3 layers, the rolling-up roller assembly swings upward around the rolling-up roller adjacent to the roller serving as the driving roller. As a result, the remaining two rolling-up rollers are rotated outward and upward. During such swinging operation of the roller assembly, the component rolling-up rollers continue to rotate so as to discharge the sheet of food material rolled up in the tubular shape in the space between the rollers.

[0016] Taking account of the fact that the object to be rolled up is a laminar sheet of food material, these rolling-up rollers have their circumferential surfaces appropriately roughed. This is to prevent the laminar sheet of food material from slipping over or sticking to the circumferential surfaces of the rolling-up rollers during the rolling-up operation.

[0017] The invention will now be more fully described by way of a particular embodiment.

[0018] An apparatus A according to this invention is adapted to roll up flat or laminar sheets of food material B such as cheese or ham into a tubular shape. Said laminar sheets of food material B may be, for example, sheets of cheese each having a thickness of 0.8 - 3 mm, a width of 85 mm and a length of 125 mm. Such sheet is to be rolled up by the apparatus A in 2 - 3 layers to form a tubular product B' having a diameter of about 15 mm and a length of 85 mm.

[0019] With particular reference to Fig. 3, the apparatus A to roll up the laminar sheet of food material B to form the tubular product B' is placed above a terminal zone 1 of a feeding conveyor a for the laminar sheet of food material B. The apparatus A includes a rolling-up roller assembly b adapted to roll up said laminar sheet of food material B to form the tubular product B' and a discharging conveyor c. The latter extends below said rolling-up roller assembly b and has its starting zone 2 immediately below said rolling-up roller assembly b.

[0020] The feeding conveyor a comprises a plurality of rope belts 3 extending in parallel to one another in a feeding direction. The discharging conveyor c is provided in the form of a roller chain 4 comprising a plurality of rollers each extending transversely of said feeding direction.

[0021] The rolling-up roller assembly b comprises four rolling-up rollers d, e, f, g arranged with their axes on a circle. If the rollers were not of substantially equal diameter then it would be necessary to ensure that their circumferential surfaces were on a circle. Of course, what is more important is that the circumferential surfaces of the rollers are in a circle.

[0022] The rolling-up roller assembly b is supported in a cantilever fashion with respect to the feeding direction about roller e.

[0023] With reference now to Figure 2, the most upstream rolling-up roller d serves also as a driving roller and has an extension shaft dl rotatably supported by a pair of frame plates 5. The extension shaft d1 further extends outward to carry thereon an input roller 6.

[0024] The rolling-up rollers e, f, g have their extension shafts e1, f1, g1 rotatably supported by a pair of bearing plates 7, provided outside said frame plates 5, respectively. Of these extension shafts e1, f1, g1, the extension shaft el of the rolling-up roller e adjoining the rolling-up roller d (which also serves as the driving roller) extends through the frame plates 5.

[0025] The other rolling-up rollers f, g have their extension shafts f1, g1 adapted to swing outward and upward around the extension shaft el of the rolling-up roller e.

[0026] Swinging upward of said rolling-up rollers f, g is enabled by an arrangement as follows. A joint ball 10 is fixed to the upper end of an elevating lever 9 having its lower end connected to a cylinder 8 adapted to lift said lever 9. The ball joint 10 is, in turn, rotatably mounted on an outer end of a rocking shaft h extending through the bearing plates 7. With this arrangement, the rolling-up rollers f, g swing up- and downward around the rolling-up roller e as the shaft 9 is vertically driven by the cylinder 8.

[0027] Transmission of rotational movement from the rolling-up roller d to the remaining rolling-up rollers e, f, g is effected by an elastic belt 11. The elastic belt 11 is wound about pulleys d2, e2, f2, g2 which are, in turn, mounted on the respective extension shafts d1, e1, f1, g1. The rolling-up roller d is driven by an input belt 12 wound about an input roller 6 fixed on the outer end of the extension shaft d1.

[0028] Now the manner in which the laminar sheet of food material B is rolled up to form the tubular product will be described with particular reference to Figure 4.

[0029] The laminar sheets of food material B are transported by the feeding conveyor a at regular intervals. Every time the laminar sheet of food material B reaches the roller assembly b, the input belt 12 drives the input roller 6. The input roller 6 drives, in turn, the extension shaft dl and therefore the rolling-up roller d. Thus, the pulleys d2, e2, f2, g2 mounted on the extension shafts d1, e1, f1, g1, respectively, and the belt 11

successively wound about them are driven. As a result, the rolling-up rollers e, f, g are rotated in the same direction, i.e. in the direction enabling the laminar sheet of food material B to be effectively rolled up to form the tubular effect.

[0030] The laminar sheet of food material B enters the space between the rolling-up rollers and is rolled up along the inner surface of the rolling-up assembly b until rolled up into a thickness of 2 - 3 layers as the component rollers rotate. Thereupon, the rolling-up roller assembly swings upward so that the rolling-up rollers f, g may be opened outwardly. During this upward rotation of the roller assembly the rollers continue to rotate.

[0031] Swinging upward of the rolling-up roller assembly b occurs with the respective rolling-up rollers continuing to rotate in a manner as follows. The cylinder 8 is actuated to lift the elevating lever 9 and the joint ball 10 fixed to the upper end of said lever 9. Consequently, said joint ball 10 causes the rocking shaft h and therefore the bearing plates 7, to swing upward around the extension shaft el of the rolling-up roller e. Obviously, the frame plates 5, also swing upward together with the bearing plates 7, to open the rolling-up roller assembly outward.

[0032] The swinging upward of the bearing plates 7, causes the rolling-up rollers f, g having their extension shafts f1, g1 rotatably supported by said bearing plates 7, to be rotated outward. In this way, these rolling-up rollers f, g move away from the tubular product B' obtained from the laminar sheet of food material B.

[0033] Now the individual tubular product B' drops to the discharging conveyor c in the form of the roller chain 4 underlying the assembly b. The tubular product B' is placed on the conveyor c between a pair of the adjacent rollers (each of which extend transversely of the roller chain 4) to be conveyed away.

[0034] As soon as the tubular product B' has been discharged onto the discharging conveyor c, the next laminar sheet of food material is fed into the rolling-up roller assembly b to be rolled up to form the tubular product B'.

[0035] This is achieved by appropriately adjusting a distance between each pair of the succeeding laminar sheets of food material B on the feeding conveyor a. Specifically, said distance may be adjusted to be substantially equal to a distance by which the feeding conveyor a travels before the preceding laminar sheet B has completely been processed.

[0036] The input roller 6 is driven by the input belt 12 to rotate the respective rollers of the rolling roller assembly b. Thus the latter rolls up the laminar sheet of food material B in 2 - 3 layers to form the tubular product B'.

[0037] In brief, the laminar sheets of food material B are fed at a predetermined speed into the rolling-up roller assembly b to be successively rolled up to form the tubular products B'. As has already been described, each laminar sheet B is rolled up by said rolling-up roller assembly b driven by the input belt 11. In response to formation of each tubular product B', the cylinder 8 moves the lever 9 upward so that the rolling-up roller assembly b may swing upward. As a result, the rolling-up rollers f, g are opened outward and the product B' drops onto the discharging conveyor c to be conveyed away.

[0038] As has previously been mentioned, the apparatus according to this invention rolls up the laminar sheets of food material such as cheese or ham to form the tubular products. Such laminar sheets of food material are relatively short-sized and have conventionally been rolled up to form the tubular products through manual operation. This invention provides the apparatus adapted to mechanically and efficiently roll up such laminar sheets to form the tubular products without requiring the laminar sheet to be wound around a core.

[0039] The apparatus according to this invention substantially comprises an assembly including a plurality of same diameter rolling-up rollers arranged on a concentric circle. These rolling-up rollers are adapted to rotate at the same speed in a direction enabling each laminar sheet of food material to be rolled up to form a tubular product. Every time the laminar sheet has been rolled up in 2 - 3 layers, the rolling-up roller assembly is partially opened outward with the respective rollers continuing to rotate to discharge the tubular product. In this way, it is possible to obtain the products having a uniform shape with an extremely high efficiency.

[0040] Both the drive mechanism for the rolling-up roller assembly and the elevating mechanism adapted for partially opening said assembly are placed on the same side of the apparatus with respect to the feeding direction. Such placement is effective to simplify not only the apparatus as a whole but also the operation thereof. Thereby a possibility of the apparatus breakdown is reduced and the apparatus maintenance is facilitated. The rolling-up roller assembly supported in the cantilever fashion can bear the load since the object to be rolled up in the tubular shape is lightweight.

[0041] The component rollers of the rolling-up roller assembly have their circumferential surfaces appropriately roughed to prevent the laminar sheet of food material from slipping on or sticking to the circumferential surfaces. In this way, there is no apprehension that the laminar sheet might slip on the roller at a moment of entering into the rolling-up roller assembly. The roughness of the circumferential surfaces can also avoid an apprehension that the laminar sheet might stick to the roller and consequently be introduced between a pair of the adjacent rollers. Thus the laminar sheet of food material can be smoothly rolled up into the tubular shape.

Claims

1. Apparatus for rolling up a laminar sheet (B) of food material into a tubular shape (B') comprising:

   an assembly (A) of multiple rolling-up rollers (d,

e, f, g) located at a terminal zone (1) of a conveyor (a) carrying said laminar sheet (B) of food material,
said rolling-up rollers (d, e, f, g) having substantially equal diameters and rotating at substantially the same speed and arranged with their axes on a circle so that said multiple rolling-up rollers may contact an outer surface of said laminar sheet (B) of food material and thereby roll up the laminar sheet of food material into a tubular shape (B').

2. Apparatus according to claim 1, wherein the roller (d) which is first passed by the laminar sheet (B) of food material while on the conveyor (a) also serves as a driving roller and said assembly (A) is mounted so as to allow the assembly (A) to be rotated upward, without interrupting rotation of the respective rollers, around the rolling-up roller (b) adjacent to said rolling-up roller (d) serving also as the driving roller so that the remaining rolling-up rollers (f, g) may be rotated outward.

3. Apparatus according to claim 2, wherein the assembly is rotated upward by an actuating cylinder (8).

4. Apparatus according to claim 2 or claim 3, wherein a driving mechanism to rotate said assembly (A) of rolling-up rollers and said actuating cylinder (8) are both placed on the same side of the apparatus with respect to a direction in which said laminar sheet (B) of food material is conveyed by said conveyor (a).

5. Apparatus according to any one of claims 1 to 4, wherein the respective rolling-up rollers (d, e, f, g) of said assembly (A) have their circumferential surfaces appropriately roughed to prevent said laminar sheet (B) of food material from slipping on or sticking thereto.

FIG. 1

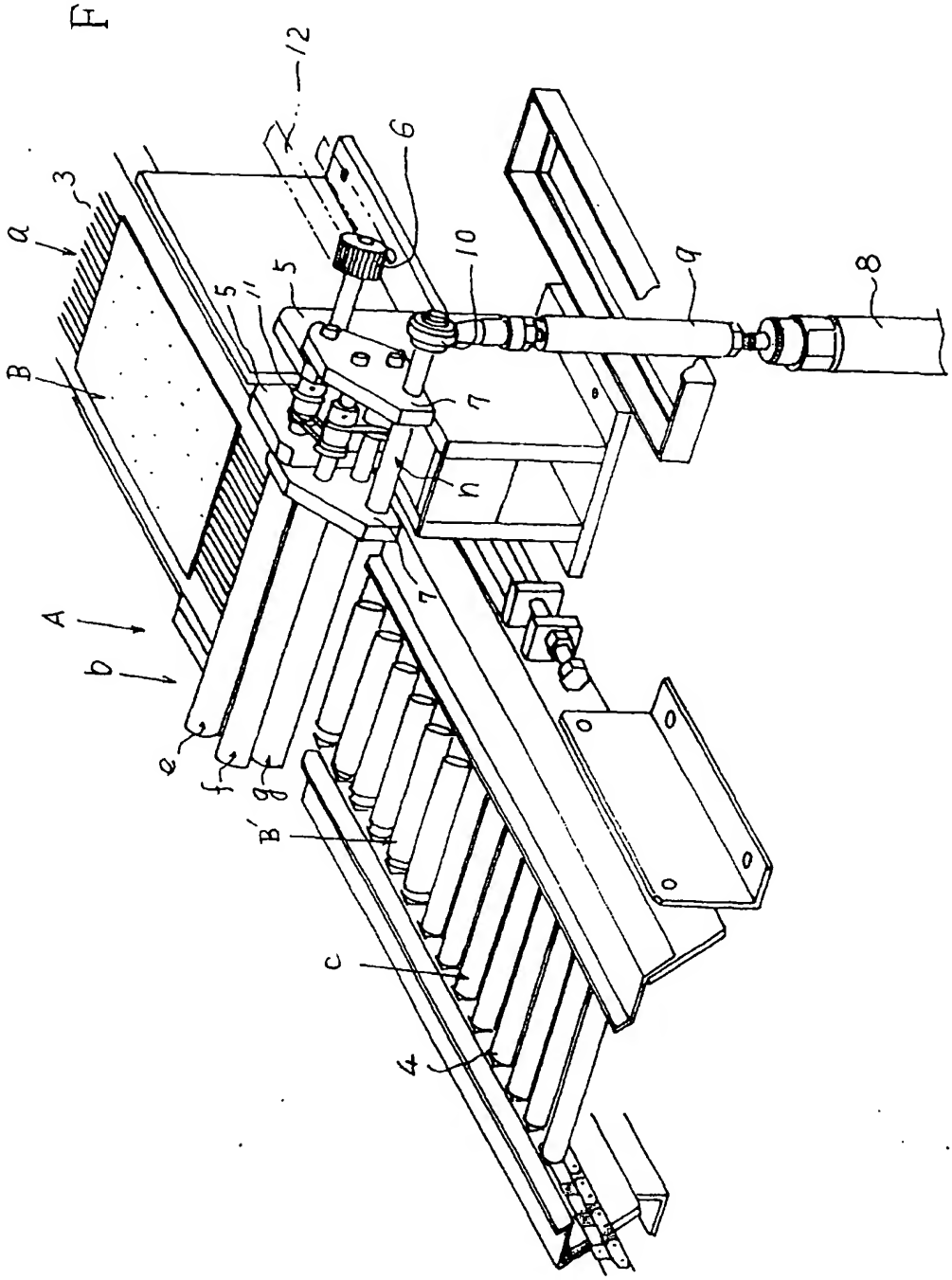


FIG. 2

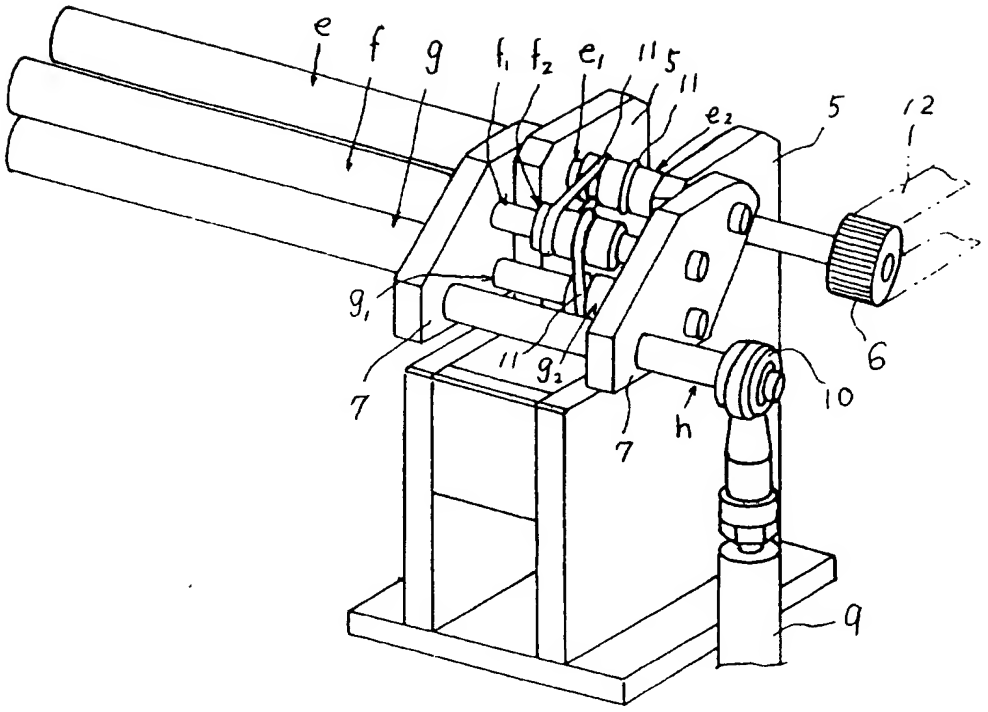


FIG. 3

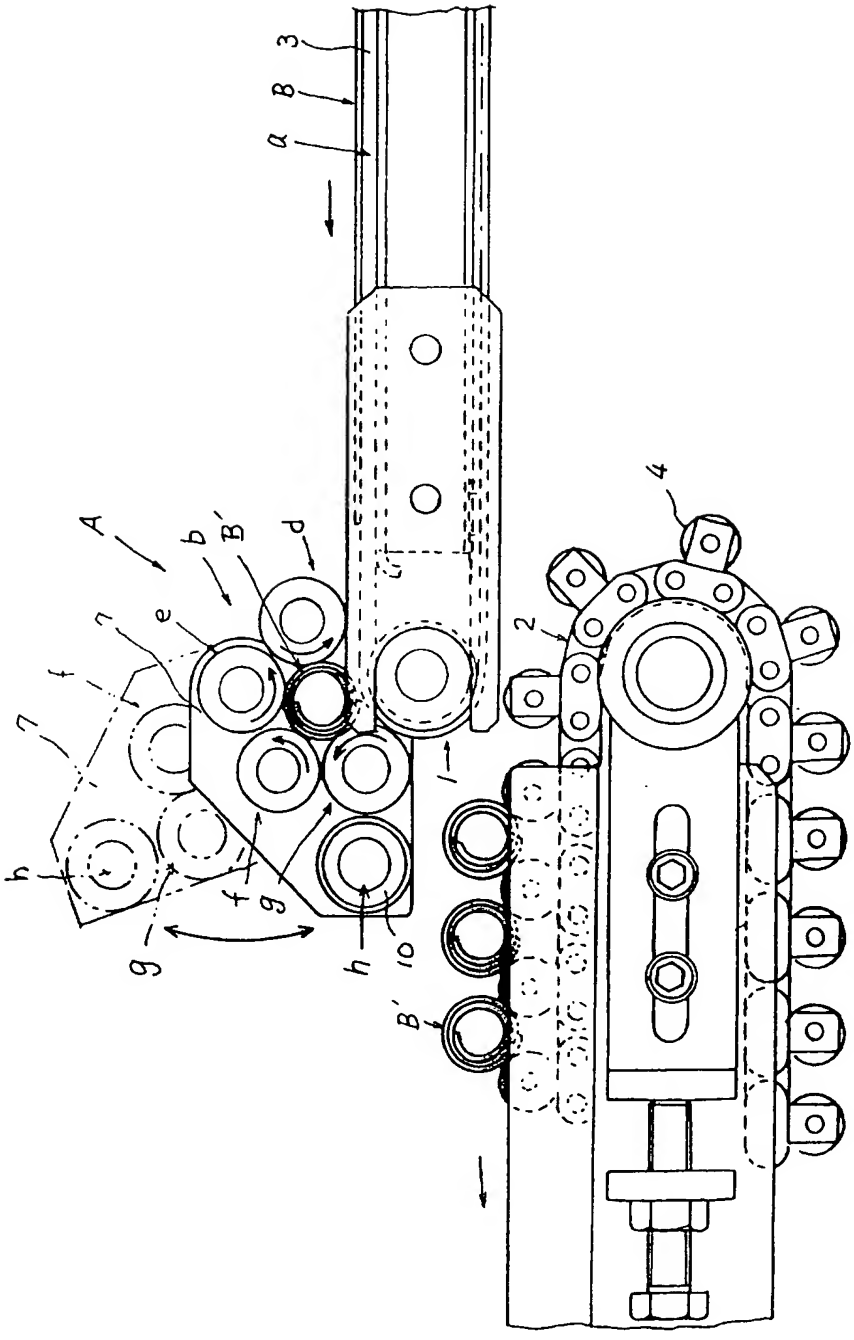
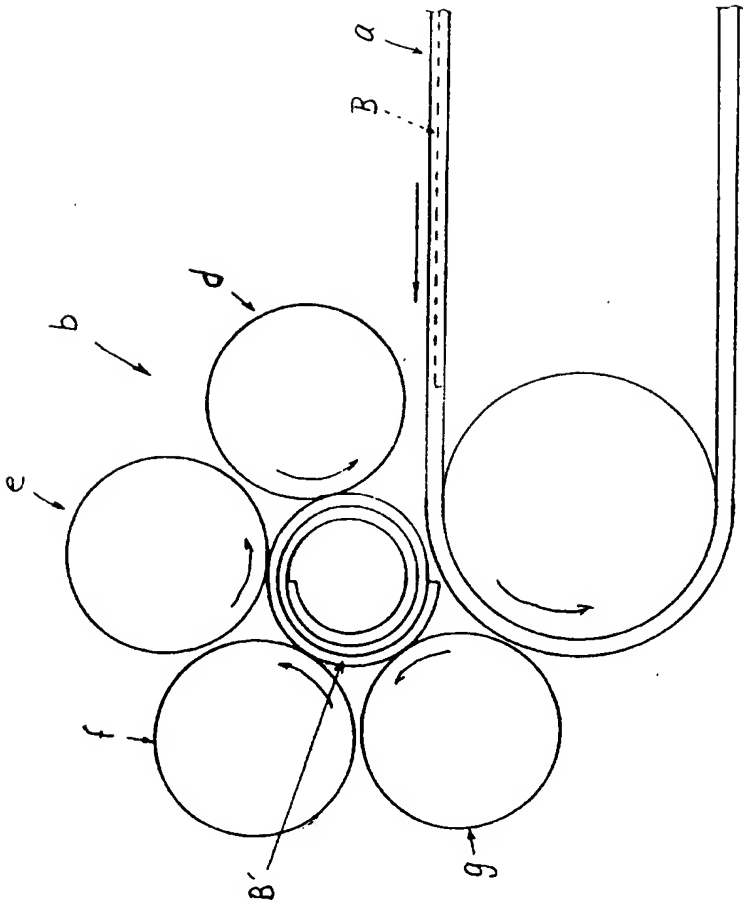


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 7158

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	EP 0 770 330 A (UNILEVER PLC ;UNILEVER NV (NL)) 2 May 1997 (1997-05-02) * the whole document *	1,2,5 3	A21C3/06
X	GB 1 541 457 A (MORINAGA & CO) 28 February 1979 (1979-02-28) * figures *	1,5	
X	EP 0 213 088 A (ITALGEL SPA) 4 March 1987 (1987-03-04) * the whole document *	1,5	
Y	DE 44 02 346 A (FRITSCH A GMBH & CO KG) 3 August 1995 (1995-08-03) * column 4, line 11 - line 44 *	3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A21C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	20 July 2001	MARZANO MONTERO.., M

CATEGORY OF CITED DOCUMENTS

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20-07-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0770330 A	02-05-1997	JP 9121750 A	13-05-1997
GB 1541457 A	28-02-1979	JP 981433 C	27-12-1979
		JP 51139660 A	02-12-1976
		JP 54013506 B	31-05-1979
EP 0213088 A	04-03-1987	IT 1187190 B	16-12-1987
		AT 56587 T	15-10-1990
		DE 3674294 D	25-10-1990
DE 4402346 A	03-08-1995	DE 59500716 D	30-10-1997
		WO 9520322 A	03-08-1995
		EP 0740508 A	06-11-1996

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